EPA United States Environmental Protection Agency

The Passaic River's Polluted Past

April 2014

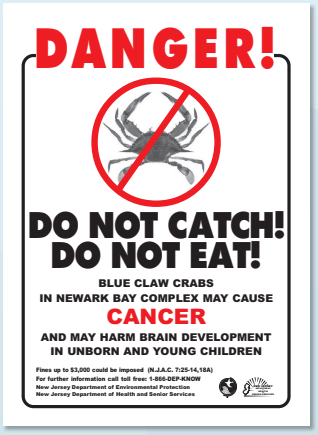
The Problems

A century of industrialization and development throughout the Passaic River watershed have left behind toxic muck on the bottom and banks of the Passaic River. From Newark Bay to the Dundee Dam in Garfield, New Jersey, a section of the river referred to as the Lower Passaic River, the sediment is severely contaminated with dioxins, polychlorinated biphenyls (PCBs), mercury, lead and other metals, as well as pesticides and other harmful chemicals. Contaminated sediment of the Lower Passaic River poses a significant threat to people's health and the health of wildlife that live in and along the river. The primary risks are from eating contaminated fish and shellfish from the river.

Mercury, PCBs and dioxins are among the major contaminants found in fish and shellfish in the Lower Passaic River, its tributaries and Newark Bay. Fisheries have long been closed. It is prohibited to catch blue crab in these waters because they are so heavily contaminated. The state of New Jersey has for decades issued advisories warning against eating any fish caught from the Lower Passaic River because of high contaminant levels in fish tissue. These contaminants can be especially harmful to women considering pregnancy, pregnant women and nursing mothers. Children are also at risk of developmental and neurological problems if exposed to these chemicals.

Local plans for riverfront development have been obstructed because of sediment contamination. In most cases, navigational dredging has ceased altogether in the Lower Passaic, in part because contaminant levels in the sediment made treatment and disposal of dredged materials prohibitively expensive.

The majority of the contamination is located in the lower eight miles of the river, where there is up to 15 feet of accumulated sediment totaling 9.7 million cubic yards (a cubic yard is about the size of a dishwasher) that spans bank-to-bank along the river bottom. The sediment contamination found here is highly concentrated, persistent and continues to move as the river flows, adding to the pollution in the rest of the river, Newark Bay and beyond.



Wildlife at risk of exposure to contaminants include:

- **Invertebrates such as the blue crab,**
- **Forage fish such as mummichogs,**
- **Predatory fish such as white perch and American eel,**
- **Water-dependent birds such as the great blue heron, and**
- **Water-dependent mammals such as mink.**

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Major Contaminants of Concern

The EPA has identified many hazardous substances in the sediment of the Lower Passaic River. The following eight contaminants pose the greatest potential risks to people's health and the environment in the study area.

SUBSTANCE	DESCRIPTION & HEALTH RISKS
Dioxins and Furans	These chemicals are by-products of chemical manufacturing, combustion (either in natural or industrial settings), metal processing and paper manufacturing. The dioxin compound known as 2,3,7,8-TCDD (2,3,7,8-tetrachlorodibenzo-p-dioxin is the most toxic form of dioxin) and others were byproducts in the manufacture of herbicides, including "Agent Orange," a defoliant used in the Vietnam War. Dioxins stay in the environment for a long time and can build up in fish and shellfish. Toxic effects in humans include reproductive problems, problems in fetal development or early childhood, immune system damage and cancer. In fish and wildlife, effects include developmental and reproductive problems, hemorrhaging and immune system problems.
PCBs	Polychlorinated biphenyls (PCBs) are manmade chemicals that were used widely as coolants and oils, and in the manufacture of paints, caulking and building material until they were banned in the late 1970s. PCBs are mixtures of up to 209 compounds (or congeners). Some commercial PCB mixtures are known in the U.S. by their industrial trade name, Aroclor. PCBs stay in the environment for a long time and can build up in fish and shellfish. Children exposed to PCBs may develop learning and behavioral problems later in life. PCBs are known to impact the immune system and may cause cancer in people who have been exposed to them over a long time. In birds and mammals, PCBs can cause various health effects, including anemia, liver, stomach and thyroid gland injuries, and immune system, behavioral and reproductive problems.
Mercury	Mercury is a metal that comes from a variety of sources, including metals processing, burning of coal and medical and other wastes, industrial effluent discharge and atmospheric deposition. Mercury circulates in the environment for a long time and can build up in fish and shellfish. Toxic effects in humans include developmental and reproductive problems, and effects on the brain, nervous system and kidney. In birds and mammals, mercury can cause effects in the central nervous system.
DDT	DDT is a pesticide that was banned for use in the U.S. in 1972. It was used widely to control insects on crops and to control mosquitoes that spread malaria. DDT and its breakdown products can build up in fish and shellfish and can cause reproductive effects such as eggshell thinning in birds.
Copper	Copper is a metal that enters the environment through releases from factories that make or use copper metal or compounds, leachate from landfills, combustion of fossil fuels, wood processing, fertilizer production and natural sources such as dust from soils, volcanoes and forest fires. Although copper is an essential element at low levels for all organisms, at higher levels it is highly toxic in aquatic environments and can build up in fish and shellfish. Copper can cause adverse effects in fish, invertebrates and amphibians. Copper also impacts growth, development and causes organ problems in birds and mammals.
Dieldrin	Dieldrin is a pesticide that is no longer produced or used, but was once used extensively as an insecticide on crops or to control termites. It can build up in fish and shellfish. Dieldrin is highly toxic to aquatic crustaceans and fish. Dieldrin also causes liver damage, central nervous system effects and suppression of the immune system in mammals and eggshell thinning in birds.
PAHs	Polycyclic aromatic hydrocarbons (PAHs) are chemicals that are a major component of petroleum products, or are formed during incomplete burning of coal, oil, gas, wood or other substances. PAH molecules are composed of two or more carbon and hydrogen rings. There are more than 100 different PAHs, which generally occur as complex mixtures. PAHs are toxic to invertebrates and cause inhibited reproduction, delayed emergence, sediment avoidance and mortality. In fish, PAHs cause liver abnormalities and impairment of the immune system. PAHs can cause adverse effects on reproduction, development and immunity in birds and mammals.
Lead	Lead occurs naturally in the environment, but most of the higher levels found in the environment come from mining or factories that use lead compounds. Lead is also released into the air during burning of coal, oil or waste. Lead can cause muscular and neurological effects in fish. It is also toxic to invertebrates and can cause damage to the nervous system in birds and mammals.


BELLEVILLE TWP
Belleville Tpke
LYNDHURST TWP
8.3
8.1
Railroad Crossing
NORTH ARLINGTON BORO
BERGEN
HUDSON
KEARNY TOWN
Railroad Crossing
EAST NEWARK BORO
Central Avenue
I-280
Railroad Crossing
Bridge Street
HARRISON TOWN
NJ Turnpike
Railroad Crossing
HUDSON
ESSEX
Railroad Crossing
Jackson Street
US 1
US 1 Truck
NEWARK CITY
Railroad Crossing
JERSEY CITY
River Centerline
Municipal Boundary
County Boundary
Bridge
Highway
Primary Road
Railroad
0 500 1,000 2,000 3,000 4,000 Feet

The Causes of Pollution in the Lower Passaic River

The Lower Passaic River has a federally authorized navigation channel, which was constructed at the end of the 19th century, then sporadically maintained in various portions of the river through 1983. As maintenance dredging declined and stopped, the artificially deep navigation channel filled with sediment. At the same time, industrial activities along the river grew, and industries and municipalities disposed of wastewater in the river. The coincidence of disposal in the river of large quantities of chemicals that bond with sediment particles, along with the filling-in of the navigation channel, created an ideal situation for the accumulation of contaminated sediment in the river bottom. The total estimated amount of contaminated fine-grained sediment in the lower Passaic River is approximately 9.7 million cubic yards.

When maintenance dredging was largely stopped in the 1950s in most of the lower eight miles, sediment filling rates were relatively high (approximately four inches per year) and coincided with a period when industrial discharges were most active, so the deepest sediment is the most highly contaminated. Sediment that is deeper in the river bed erodes less. This is due to the consolidation of deeper sediment over time from the weight of overlying sediment. The surface sediment is more subject to daily tidal actions and occasional scouring during high river flows. These river movements cause the contaminated surface sediment to be resuspended and redeposited while occasionally uncovering and resuspending deeper, more highly contaminated sediment. Median concentrations of contaminants have remained almost unchanged over a 17-year sampling period.

More than 100 industrial facilities have been identified as potentially responsible for discharging a number of contaminants into the river, including, but not limited to, dioxins and furans, PCBs, PAHs, DDT and other pesticides, mercury, lead and other metals. About 70 companies that owned or operated those facilities have formed a group named the Cooperating Parties Group (CPG) and signed an agreement with the EPA to perform a remedial investigation and feasibility study for the 17-mile Lower Passaic River with EPA oversight.

The Lower Passaic River studies and cleanup efforts are a part of the EPA's cleanup of the Diamond Alkali Superfund site, a former manufacturing facility located at 80-120 Lister Avenue in Newark, New Jersey, which began producing DDT and other products in the 1940s. From the 1950s to 1960s, the facility was operated by the Diamond Alkali Company (later purchased by and merged into Occidental Chemical Corporation), which used the facility for the manufacture of the defoliant chemical known as "Agent Orange," among other products. A by-product of this manufacturing process was 2,3,7,8-TCDD, which was released into the river. After investigations by the state of New Jersey and the EPA, the site was listed on the EPA Superfund program's National Priorities List in 1984. A cleanup plan for containment of the dioxin contamination was selected in 1987, which included a variety of strategies including capping, subsurface slurry walls to keep the contaminated material from moving, and a ground water treatment system. In 2001, the interim cleanup of the 80-120 Lister Avenue site was completed.

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